



Florida Citrus Inventory Modernization Project

Building a GIS of Florida's Commercial Citrus Groves

Dave M. Johnson, Geographer

United States Department of Agriculture
National Agricultural Statistics Service
Research and Development Division



Presentation Overview

- NASS background
- Florida citrus industry facts
- Citrus inventory program
- Pre-GIS methodology
- Reasons to adopt a GIS
- Digitizing methodology
- Progress to date
- Future and related work



The National Agricultural Statistics Service

Provider of timely, accurate, and useful statistics in service to U.S. agriculture

NASS - Data and Statistics - Microsoft Internet Explorer

Address: http://www.nass.usda.gov/Data_and_Statistics/index.asp

United States Department of Agriculture
National Agricultural Statistics Service

The 2002 Census of Agriculture is the most comprehensive source of statistics portraying our nation's agriculture

Home | About NASS | Newsroom | Publications | **Data and Statistics** | Census | Surveys | Help | Contact Us

You are here: Home / Data and Statistics

Data and Statistics

Quick Stats (Agricultural Statistics Data Base)

NASS publishes U.S., state, and county level agricultural statistics for many commodities and data series. Quick Stats offers the ability to query by commodity, state(s) and year(s), providing the most up-to-date statistics including all revisions. The query dataset can be downloaded for easy use in your database or spreadsheet.

- Query our Quick Stats Data Base

Additional Crops County Resources

Maps of crops county estimates for acreage and yield are available from NASS as both CSV data files and maps.

County data from Quick Stats data is also available in pre-extracted data sets by year and by crop.

Census of Agriculture

To query Census of Agriculture data, choose from the Census years below. To view the Census publications, click here:

- Data Queries for 2002, select below:

Select a Census Query [Go]

- Data Queries for 1997, 1992, 1987

Interactive Data

NASS provides a variety of tools for interacting with our Census datasets.

- Interactive Statistical Maps
- Interactive Census Maps for 2002 Census Highlights
- Table Lens Application for 1997 Census Data

Last modified: 12/30/05

NASS Home | USDA.gov | FEDSTATS | Economic Statistics System (ESS) | Site Map | FOIA | Accessibility Statement | Privacy Policy | Non-Discrimination Statement | Information Quality | FirstGov | W

2001 Wildlife Damage Survey

7.7 Percent of Crop Value Lost to Deer and Geese

Maryland farmers lost \$17.2 million of corn, soybeans and wheat to deer and geese during the 2001 growing season, translating to a 7.7 percent loss of crop value to deer and geese. Soybeans for the greatest economic loss, totaling \$9.1 million, 11 percent. Corn losses were \$6.6 million and wheat \$1.5 million, 5.6 percent. Deer damage resulted in losses of \$13.6 million, 6.1 percent. Geese losses were \$3.6 million, 1.6 percent.

Production losses totaled 6.0 million bushels. Corn losses were 3.2 million bushels, soybean 2.2 million bushels and wheat accounted for 0.6 million bushels. Production losses to deer were 1.5 million bushels and geese 1.3 million bushels.

In terms of yield, losses to deer were most severe in Central and Western Maryland, while geese were greater on the Eastern Shore. Corn yield losses of 9.0 bushels per acre and 7.4 bushels per acre in Central and Western Maryland, respectively. The Lower Eastern Shore reported the highest loss of 6.1 bushels per acre.

Sixty-two percent of farms reported deer or geese damage to one or more crops. Damage was reported on 48 percent of farms raising corn, 58 percent of farms growing soybeans and 27 percent of farms growing wheat.

Maryland 2001 Crop Loss from Deer

| Region | Crop | Acres Harvested | Harvested Yield (bushels) | Average Yield Loss (bushels) | Production Loss (\$) |
|---------------------|----------|-----------------|---------------------------|------------------------------|----------------------|
| Western Maryland | Corn | 5,500 | 114,400 | 7.4 | 40,700 |
| Lower Eastern Shore | Soybeans | 300 | 36,000 | 3.6 | 12,960 |

WISCONSIN AGRICULTURAL STATISTICS SERVICE
P.O. Box 8934 Madison, WI 53708-8934

In cooperation with WI Department of Agriculture, Trails and Consumer Protection

2002 Dairy Producer Opinion Survey
November 2002

Wisconsin Milk Production To Recover

Milk production is expected to increase in Wisconsin during the next five years according to a survey conducted by the Wisconsin Agricultural Statistics Service. This statewide survey of producers asked for their plans with the assumption that milk prices for the next five years will be at the same level as the past five years. The survey was conducted during May and June 2002.

Based on the survey, 60 percent of producers expect to keep the same herd size, 20 percent plan to increase herd size, and 20 percent intend to discontinue milking by 2007. Actual results will depend on future milk prices, input prices, financing availability, crop yields, and other factors.

The number of herds projected for 2007 shows that the diversity of small to large herd sizes will continue. The most prevalent herd size will remain at 50 to 99 cows.

Wisconsin Dairy Herds by Herd Size

| Milk cow herd size | May 2002 herds | May 2007 herds (projected) % | Change 2007/2002 |
|--------------------|----------------|------------------------------|------------------|
| 1-29 | 2,800 | 1,440 | -45 |
| 30-49 | 4,700 | 3,440 | -27 |
| 50-99 | 7,400 | 5,600 | -24 |
| 100-199 | 1,900 | 2,080 | +9 |
| 200-499 | 700 | 900 | +29 |
| 500+ | 200 | 440 | +120 |
| Total | 17,500 | 19,900 | +20 |

1/7th the May 2007 projection is based on farmers' opinions May-June 2002, with the assumption that milk prices for the next five years will be at the same level as the past five years.

Plans for May 2007 1/2 rd Size

| Keep herd size | Increase herd size | Discontinue milking |
|----------------|--------------------|---------------------|
| Percent | Percent | Percent |
| 47 | 17 | 36 |
| 71 | 9 | 20 |
| 85 | 19 | 18 |
| 83 | 27 | 10 |
| 93 | 59 | 8 |
| 22 | 78 | 0 |
| 82 | 29 | 20 |

Percent of Herds by Size Group 2007 Projection

Legend: 1-29, 30-49, 50-99, 100-199, 200-499, 500+

2002 Census of Agriculture

United States | All data items are from Chapter 2 - Table 1. Area Summary Highlights: 2002 Selected crops harvested - Land in orchards (acres)

State: United States - County Level | Data Item: Selected crops harvested - Land in orchards (acres)

United States Total: 5,330,439

State: [Dropdown]

State Total: [Dropdown]

County: [Dropdown]

County Total: [Dropdown]

Download data as CSV | XML | PDF

Help | Print | Return to [Home]

Legend

Scale: National | Zero or Data Withheld

- <= 20,000
- 20,001 to 40,000
- 40,001 to 60,000
- 60,001 to 80,000
- 80,001 to 100,000
- 100,001 >=

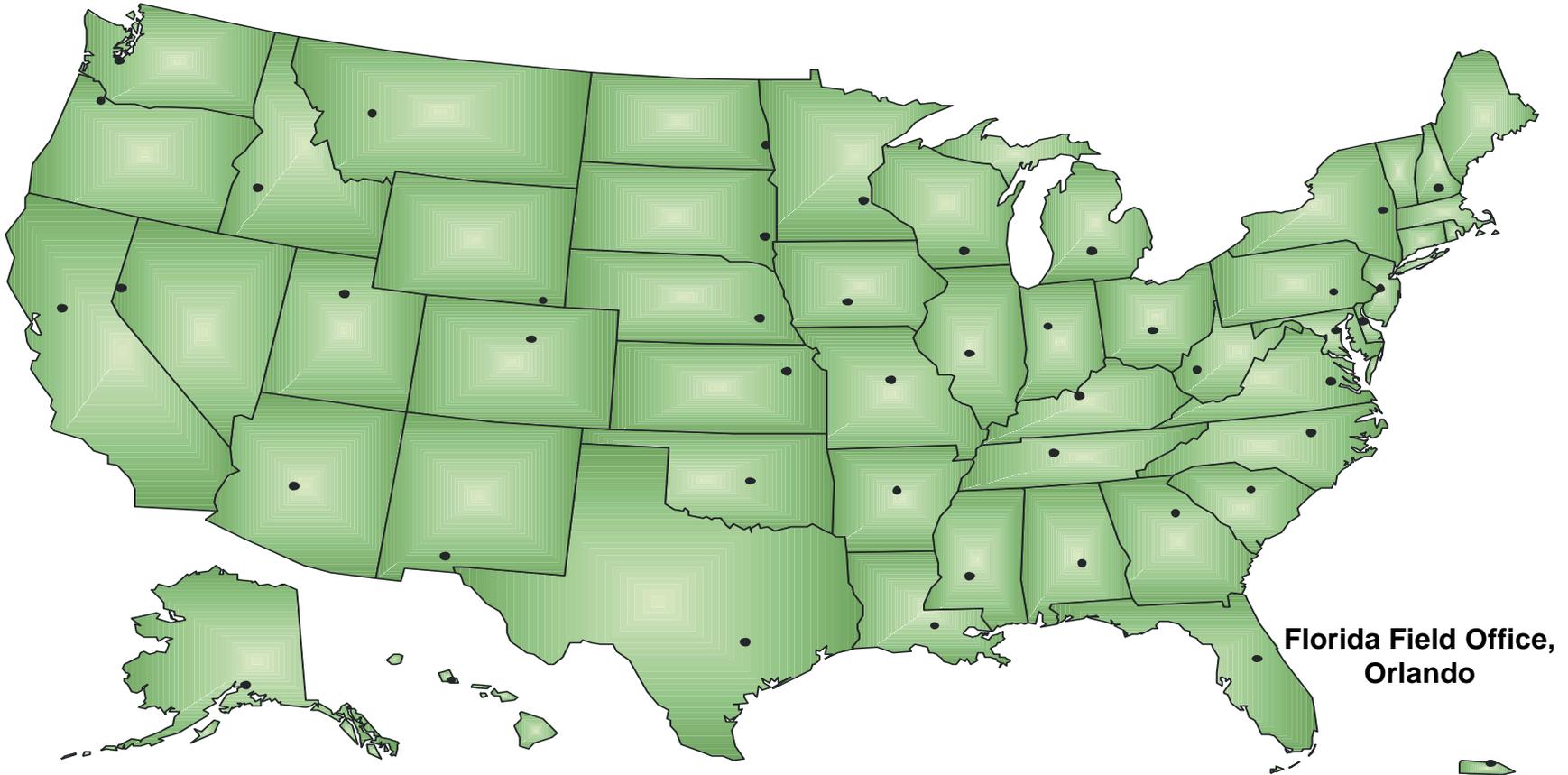
Color: Green [Dropdown]

Source: USDA-NASS 2002 Census of Agriculture © USDA-NASS 2005-2006

Navigate: Mouse-over a specific state/county to view the state/county level data. Right click to zoom (option-click for MAC users). Hold the Alt key and click+drag to pan. For additional assistance with this application, click here to view the support page.



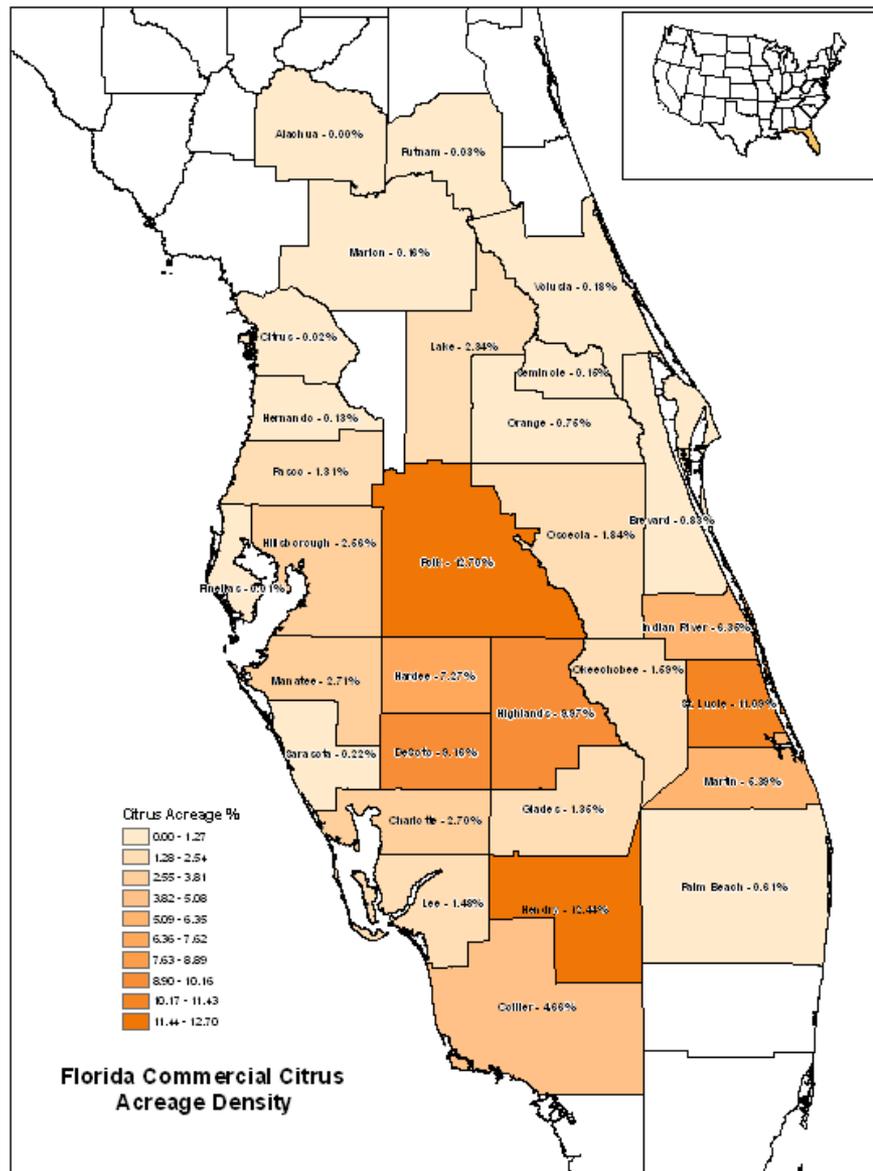
NASS Field Office Locations



**Florida Field Office,
Orlando**



Distribution of Commercial Citrus in Florida, 2004



Florida citrus industry facts

- 750,000 acres (1170 sq. miles, 304,000 hectares)*
- 80% oranges, 10% grapefruits, 10% specialty*
- Leading producer in world of grapefruits**
- Second, to Brazil, in orange production**
- 90% canned, chilled, or concentrated**
- 80% of U.S. supply**
- \$9.13 Billion industry**
- 89,700 jobs**



*NASS/FFO 2004

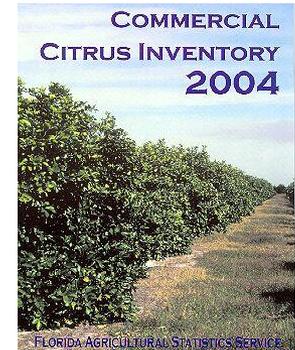
**UF/IFAS 2000



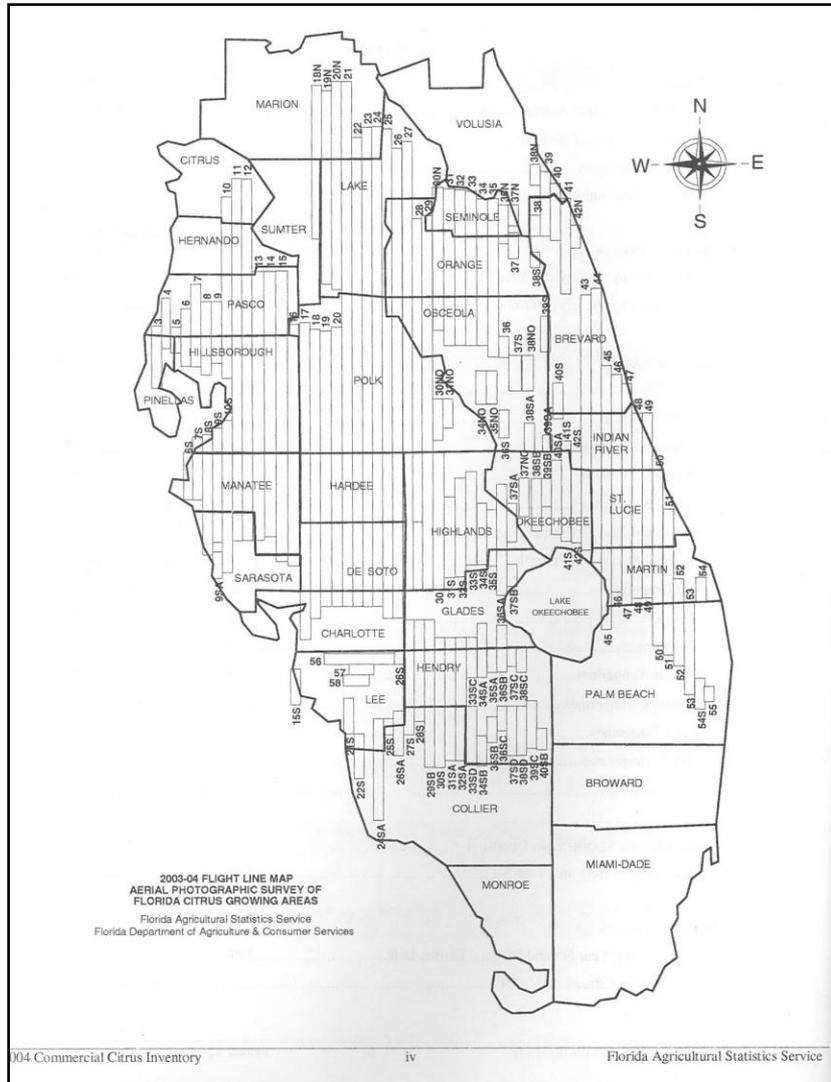


Florida Agriculture Statistics Service Citrus Program

- Census of commercial citrus tree inventory published every 2 years
 - Information provided at county level of acreage and tree counts
 - Includes tabulated statistics of citrus tree planting dates and variety
 - Special interim surveys for 7 counties undertaken in 2005 in response to hurricane damage
 - Tree information stored in a tabular database that is updated each survey cycle
 - Cooperative undertaking with the Florida Department of Agriculture and Consumer Services and sponsored by the Florida citrus industry



Past census methodology

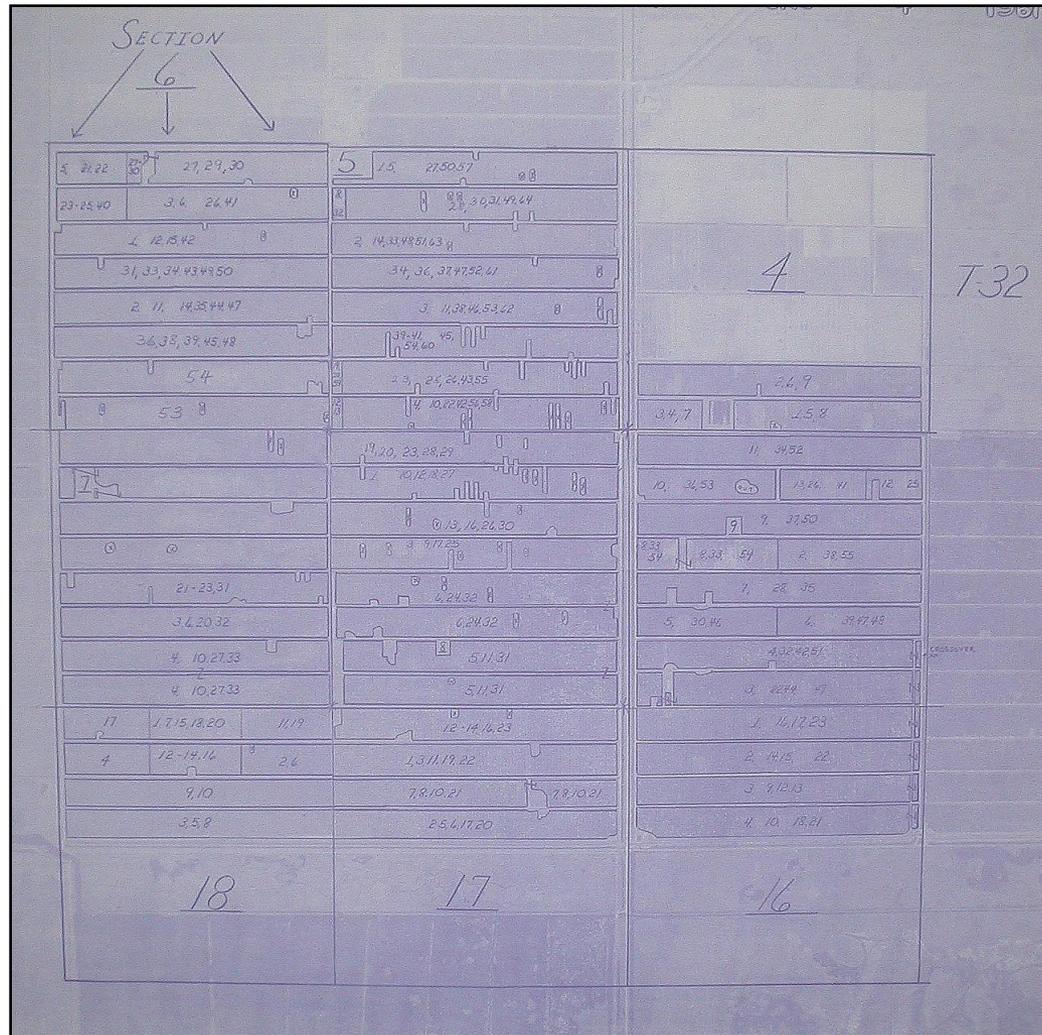


- Aerial film-based imagery flown biennially
- Imagery is photo interpreted manually to determine groves that have likely undergone change since last census



- Field survey crews dispatched to the areas to assess and record any changes
 - Tree counts
 - Variety, Year, Spacing
 - if new planting
- Tabular data updated with observations of field crew





Example survey “ozalid” style map showing hand drawn grove and section boundaries and labeled with basic record information



Drawbacks of past system

- Over 1000 hand-drawn maps must be reworked each survey cycle
 - Labor intensive
 - Time consuming
- Limited spatial analysis capabilities
- Difficult to use ancillary GIS information that is already available
 - Digital aerial photography
 - GPS data
 - Related GIS sources
 - Roads
 - Land-cover
 - Tax parcels
 - Etc....



Benefits of the GIS-based citrus census

- More efficient
- Lower cost
 - ...in the long run
- Sharing of data
- GPS tools can be incorporated
 - PDA/Tablet PCs
- Increased analytical ability
 - Spatial-based queries/summaries
 - Other GIS capabilities
 - Tracking disease (canker, greening)
 - Hurricane analysis (overlay tracks)
 - Land cover conversion (urbanization)
- Cartographic capabilities
 - Eliminates manual polygon and label redrawing
 - Customizable and consistent map layouts



GIS data capture methodology

- Using ESRI ArcGIS as software platform
 - Industry standard
 - Large user community
 - USDA has site-wide license
- Gathered existing digital data
 - Georeferenced 2004 aerial 1 meter resolution imagery (DOQQs) from Florida Department of Environmental Protection
 - Ancillary information sets including the PLSS grid, county boundaries, roads, infrastructure etc.
 - FASS tabular tree census database
 - SAS based
- Gathered existing analog data:
 - FASS map sheets



Grove boundary creation

- Digitizing of 2004 grove layer within ArcGIS
 - Used 2004 DOQQ imagery for spatial reference
 - Used 2004 hand drawn maps as grove boundary ground truth
- Utilizing ESRI's Shapefile GIS data format for initial digitizing of polygons
 - Process involved heads-up digitizing technique
 - Included editing of block numbers within feature attribute table
 - Drawing precision was specified at 3 meters, or 1:4000 scale



Digitizing comments



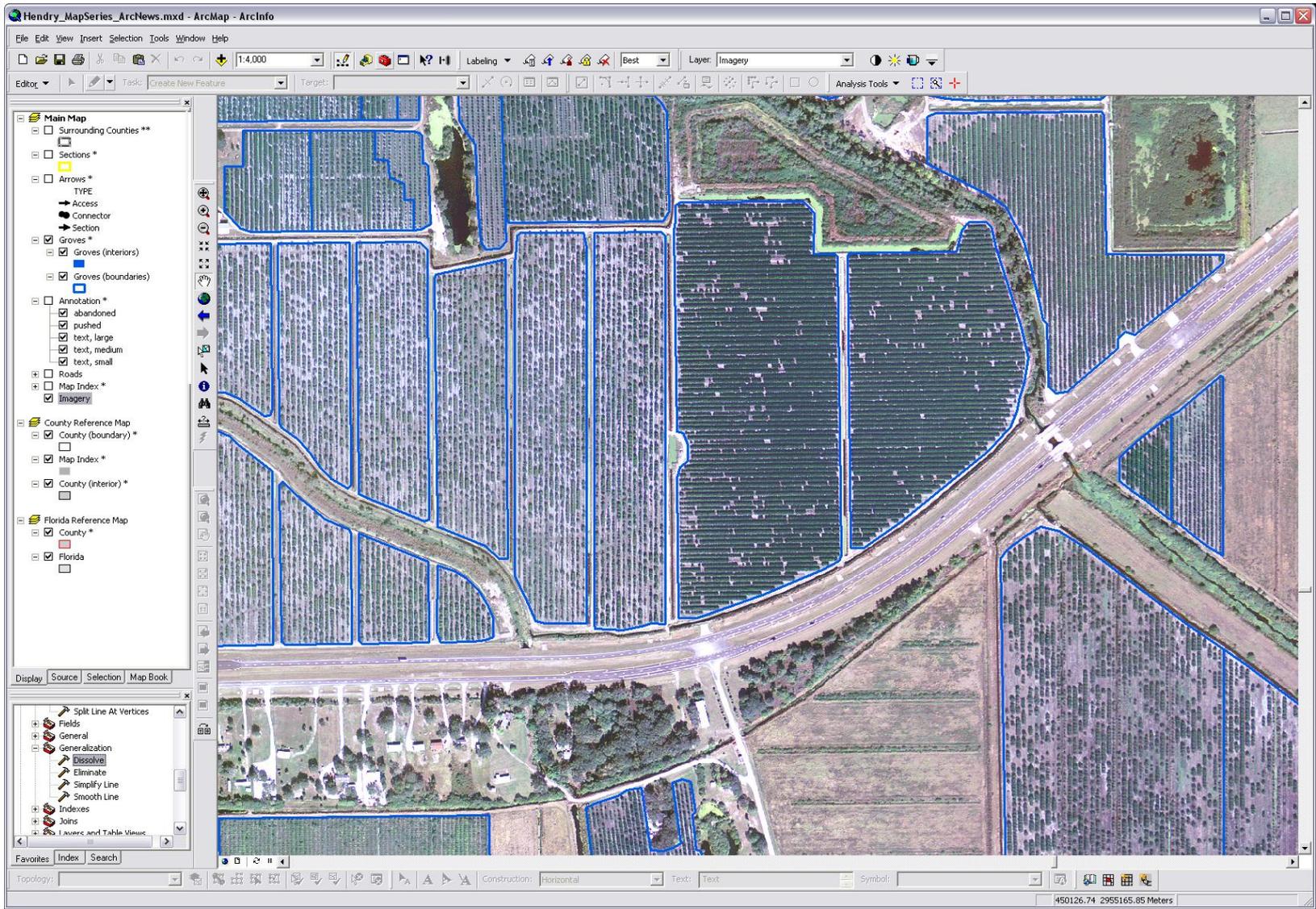
- Digitizing was relatively slow
- Started in early 2005, nearly 100% was complete a year later
- Many people with a range of computing skill levels helped with the digitizing effort.
 - A challenge to train
 - A challenge to manage
 - Most were not familiar with concepts of a GIS
 - Most had never used ArcGIS before



Beyond just digitizing

- Other steps and information were added to the citrus GIS including:
 - Migration of boundary polygons from Shapefile to personal geodatabase format
 - Topology validation assuring no polygons overlapped
 - Creation of an “inactive” grove layer in addition to the active one
 - Parcels of land that have a high potential to become productive again
 - Digitizing of annotation
 - Special labels unique to the enumerators, could contain grower contact information, field notes, grove access routing, landmarks etc.
 - Linking the polygons to the tabular files via relational database
 - Revising of the Public Land Survey System grid
 - township, range, sections boundaries
 - Building of map series
 - Plotting output
 - Checking for errors!





Screen capture of ArcMap in action

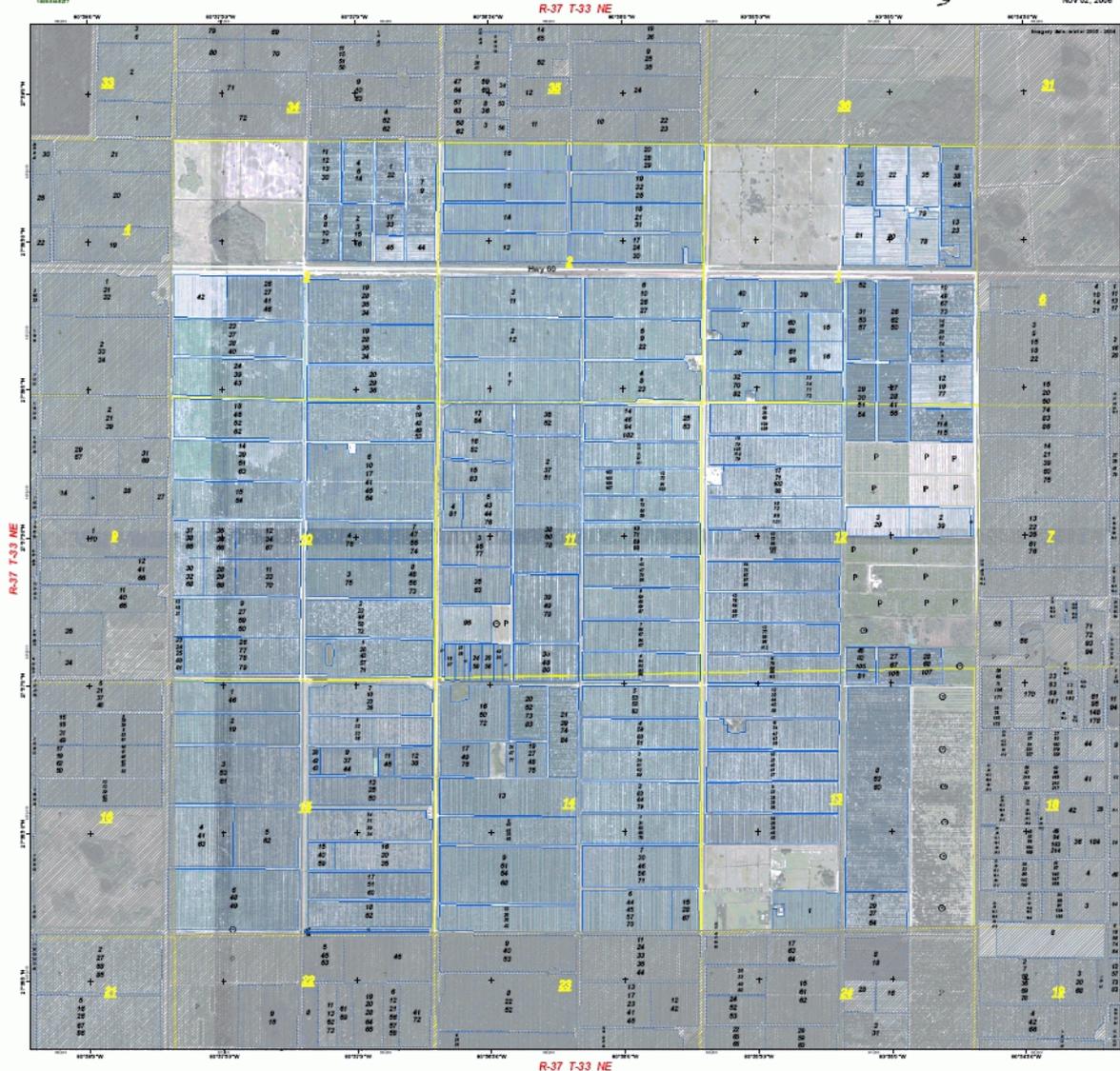




Florida Commercial Citrus Inventory 2005

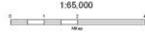


Indian River
R-37 T-33 NE
14 of 53
Nov 02, 2006



Map sheet example

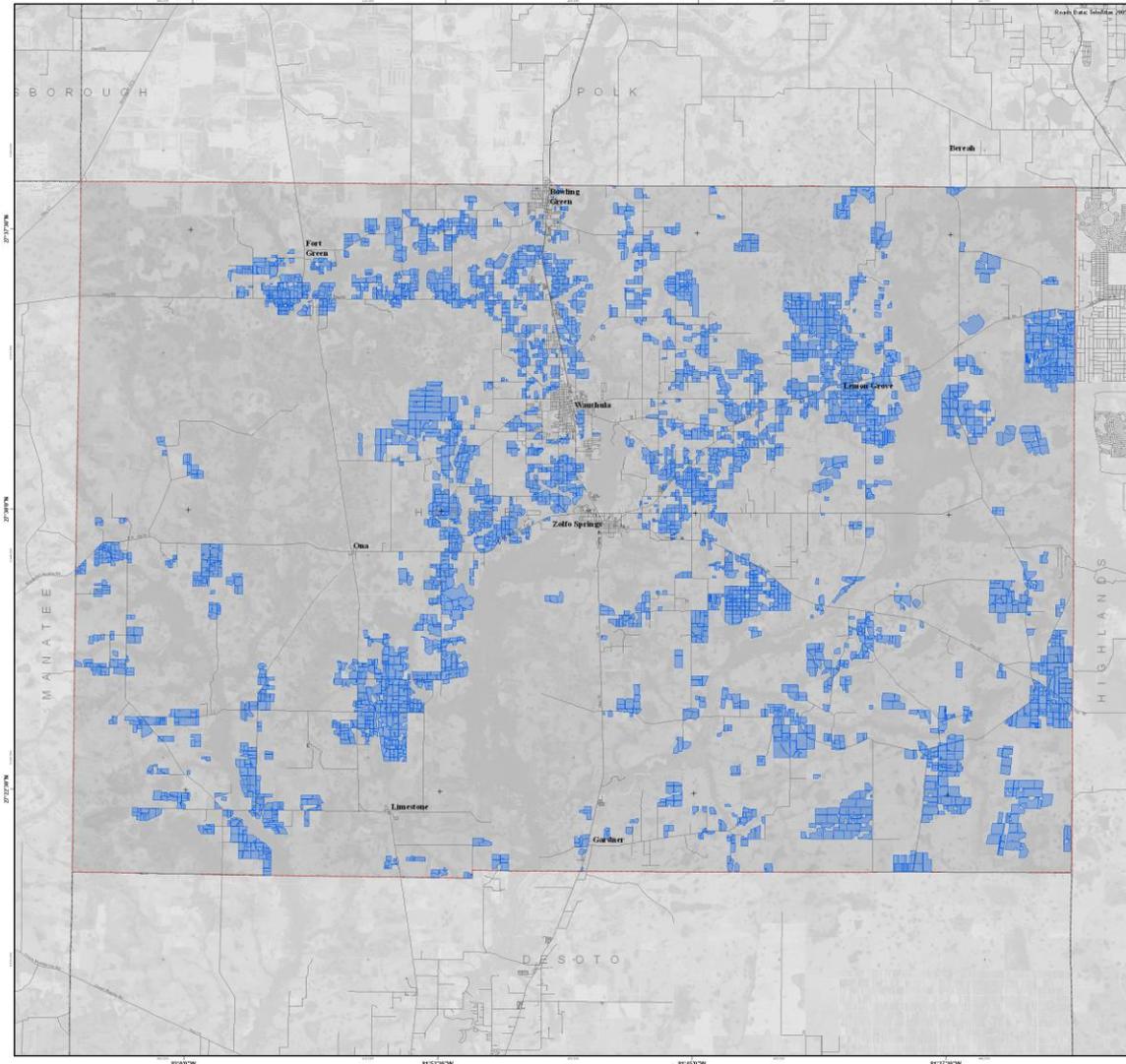




Florida Commercial Citrus Inventory 2005



Hardee



County reference map example



Some statistics

- Approximately 40,000 commercial groves were digitized
- The groves contain records for nearly 130,000 plantings
- Over 1000 unique map sheets created
 - Based on quadrants of the Public Land Survey System Townships
 - 1:8000 scale
 - Each contain 9 square mile sections
- 1 year was needed to digitize and compile everything
 - With several staff members working full or part-time on the project

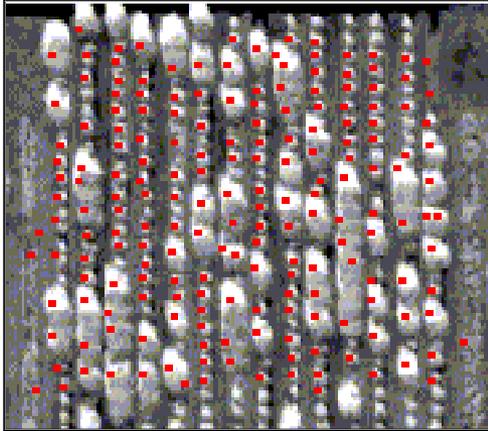


The future

- The NASS Florida Field Office now has a dedicated GIS infrastructure
 - A pioneering group within NASS!
 - Beginning to incorporate objective yield point sample data
 - Likely to become a model for other NASS state offices
 - Perhaps for inventorying other Fruits, Nuts, Berries....
- Imagery Issues
 - The citrus program relies heavily on timely high resolution imagery and currently NASS is benefiting from the freely distributable data of other groups
 - Florida Water Management districts (1 meter)
 - Florida Department of Revenue (sub 1 meter)
 - USDA National Aerial Imagery Program (NAIP) (2 meter)
 - How to manage it all
 - Computing and storage requirements are relatively large



Related research work



- Imagery exploitation

- Satellite versus aerial

- Availability
 - Cost/benefit

- Information extraction

- Tree counting
 - Change detection



- Mobile/field GIS applications

- GPS receivers

- PDA/Tablet PCs

- Citrus land-cover classification
(within Cropland Data Layer program)



Thanks

- NASS
 - www.nass.usda.gov
- NASS / Research and Development Division
 - www.nass.usda.gov/research
- NASS / Florida Field Office
 - www.nass.usda.gov/fl

- dave_johnson@nass.usda.gov

